

REMARKS

Applicants appreciate the detailed examination evidenced by the Office Action mailed November 27, 2007 ("Office Action"). Applicants also appreciate the continued allowance of Claim 19 and the continued indication that Claim 2 includes patentable subject matter. Office Action, page 4.

In response, Applicants respectfully request reconsideration of rejected Claims 1, 3-12, 14-18 and 20 and submit that the rejected claims are patentable for at least the reasons described herein.

Claim 1 is Patentable Over Yu

Claims 1, 3-5, 14, 16, 17, 18 and 20 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. patent No. 5,970,374 to Yu et al ("Yu"). Office Action, page 2.

Applicants respectfully traverse the rejection based on Yu as Yu does not disclose or suggest, for example:

- forming an intaglio pattern in a mold layer;
- forming a barrier layer on an upper surface of the mold layer and in the intaglio pattern;
- forming a flowable material on the barrier layer;
- removing a portion of the flowable material and a portion of the barrier layer outside the intaglio pattern to expose an upper surface of an oxide layer included in the mold layer and avoiding removing a portion of the flowable material and a portion of the barrier layer inside the intaglio pattern;
- removing the portion of the flowable material from inside the intaglio pattern;
- forming a conductive layer on the portion of the barrier layer inside the intaglio pattern and on the upper surface wherein the conductive layer comes in contact with the barrier layer and the upper surface, wherein the conductive layer comprises aluminum and the aluminum in the conductive layer comes in contact with the upper surface; and
- removing the conductive layer from the upper surface.

(*Emphasis added.*) In rejecting the claims, the Office Action states

Yu et al. discloses a method for forming aluminum core copper filled (col. 1, lines 15-22 and 55-62) dual damascene structures. Fig. 4C shows that the dual damascene structures are formed and have a barrier layer; a fill of flowable material is formed and the barrier is removed from the upper surface

of the insulation layer (Fig. 4D) and the structures are filled with metal which may be aluminum (Fig. 4F). The process is disclosed in col. 6, lines 38-42; col. 7, lines 1-4 and 6-13; col. 1, lines 55-62. The flowable material may be photoresist or non-photosensitive resist material (col. 7, lines 1-4). The metal is planarized by polishing which includes CMP (col. 3, lines 7-12). It is seen in Fig. 4C that the mold layer is a multilayer mold layer.

Office Action, page 2. Regarding "forming a conductive layer on the portion of the barrier layer inside the intaglio pattern and on the upper surface wherein the conductive layer comes in contact with the barrier layer and the upper surface, wherein the conductive layer comprises aluminum and the aluminum in the conductive layer comes in contact with the upper surface," as recited in Claim 1, Applicants respectfully submit that Yu appears to describe that the conductive layer is deposited via electroless plating. Yu, Figure 4F, column 7, lines 24-28. The electroless plating process described in Yu appears to deposit the conductive material in conjunction with a seed layer 428 that is catalytically active. Yu, Figures 4E and 4F, column 7, lines 34-64. Since, however, the seed layer 428 appears to be removed from the upper surface, formation of the conductive material appears to also be limited to the trenches 422 and 424. In this regard, the conductive layer does not appear to be deposited and come into contact with the upper layer. Accordingly, Yu does not disclose or suggest "forming a conductive layer on the portion of the barrier layer inside the intaglio pattern and on the upper surface wherein the conductive layer comes in contact with the barrier layer and the upper surface, wherein the conductive layer comprises aluminum and the aluminum in the conductive layer comes in contact with the upper surface," as recited in Claim 1.

Moreover, although Yu appears to provide specific discussion regarding the deposition of copper for the conductive layer, Yu does not disclose or suggest specific processes regarding the deposition of materials other than copper. Although Yu appears to describe, in the discussion of the related art, that a conductive material may include, tungsten, aluminum and copper (Yu, column 1, lines 58-59), Yu does not disclose or suggest processes for the deposition of an aluminum conductive layer, as recited in Claim 1. Further, Yu states

that "[t]he commonly used materials; Ti, TiN, Ta, and Al are not suitable as the seed layer." Yu, column 7, line 67 to column 8, line 1.

Additionally, although Yu appears to describe that a process other than electroless plating may be used to deposit the copper, Yu teaches away from the use of such process. For example, Yu states "CVD is too expensive because of the gases used to supply the copper ions." Yu, column 6, lines 61-62. Moreover, Yu states that "[t]he described method provides a method of manufacturing a semiconductor device that utilizes the advantages of electroless plating of copper that has low cost, can be conducted at low temperature and that yields high purity copper film." Yu, column 8, 18-22. Thus, since Yu teaches away from processes other than electroless plating and electroless plating does not form a conductive layer "on the upper surface wherein the conductive layer comes in contact with the barrier layer and the upper surface, Yu does not disclose or suggest several of the recitations of Claim 1.

Accordingly, independent Claim 1 is patentable over Yu for at least the reasons described above. Independent Claim 20 includes similar recitations as those discussed above regarding Claim 1 and is patentable for at least the same reasons. Furthermore, dependent Claims 3-5, 14, 16, 17, and 18 are also patentable over Yu for at least the reasons described above with reference to independent Claim 1.

Claims 7-12, 14 and 15 are Patentable Over Yu and Hussein

Claims 7-12, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yu as applied to Claim 1 and further in view of U.S. Patent Application Publication No. 2001/0055725 to Hussein et al. ("Hussein"). Applicants respectfully submit that Claims 7-12, 14 and 15 are patentable at least by virtue of the patentability of Claim 1, from which they depend. Applicants further submit that Hussein does not provide the teachings missing from Yu as discussed above regarding Claim 1. Accordingly, Applicants respectfully submit that Claims 7-12 and 15 are patentable and respectfully request the allowance thereof.

In re: Jong-myeong Lee et al.
Serial No.: 10/813,330
Filed: March 30, 2004
Page 10 of 10

CONCLUSION

Applicants respectfully submit that pending claims are in condition for allowance, which is respectfully requested in due course. Favorable reconsideration of this application is respectfully requested. If any informal matters arise, the Examiner is encouraged to contact the undersigned by telephone at (919) 854-1400.

Respectfully submitted,



Timothy J. Wall
Registration No. 50,743
Attorney for Applicants

Correspondence Address:
Myers Bigel Sibley & Sajovec, P.A.
P. O. Box 37428
Raleigh, North Carolina 27627
Telephone: (919) 854-1400
Facsimile: (919) 854-1401
Customer Number 20792

CERTIFICATION OF TRANSMISSION

I hereby certify that this correspondence is being transmitted via the Office electronic filing system in accordance with § 1.6(a)(4) to the U.S. Patent and Trademark Office on February 15, 2008.



Michele P. McMahan
Date of Signature: February 15, 2008